

## #Blatt 4, Aufgabe 2

```
data = read.table("C:/Users/Bjoern/Desktop/Eigene Dateien/Lehre/2015 SS/Oekonometrie/Blatt
4/ergebnisse.txt", header=TRUE, sep=";")
```

#a)

```
n = length(data$Anteil)
Y = data$Ergebnisse
X = matrix(1, n, 7)
X[,2] = data$Gesamtnote
X[,3] = data$Gesamtnote^2
X[,4] = log(data$Zulassung)
X[,5] = data$Anteil
X[,6] = data$Gesamtnote*data$Anteil
X[,7] = data$Anfaenger
```

```
beta = solve(t(X) %*% X) %*% t(X) %*% Y
print(beta)
print("")
```

#c)

```
R = matrix(c(1,0,0,0,1,0,0,0,0,0,-1,0,0,0,1,0,0,2,0,0,0), nrow=3)
c = c(10,0,0)
Y_hat = X %*% beta
u = Y - Y_hat
s2 = sum(u^2) / (n-7)
f = t(R %*% beta - c) %*% solve(R %*% solve(t(X) %*% X) %*% t(R)) %*% (R %*% beta - c) / (s2*3)
print(f)
if(f > qf(0.99, 3, n-7)) {
  print("H0 wird verworfen")
}else{
  print("H0 wird nicht verworfen")
}
```

#d)

```
print(summary(lm(I(u^2) ~ 1 + Y_hat + I(Y_hat^2) + I(Y_hat^3))))
```

#Ausgabe:

```
      [,1]
[1,]  9.38710162
[2,] -8.01480606
[3,]  1.56458952
[4,]  7.57539268
[5,] -0.02547941
[6,]  0.02250205
[7,]  0.19238428
[1] ""
      [,1]
[1,] 13.9999
[1] "H0 wird verworfen"
```

Call:

```
lm(formula = I(u^2) ~ 1 + Y_hat + I(Y_hat^2) + I(Y_hat^3))
```

Residuals:

```
      Min       1Q   Median       3Q      Max
```

-18.256 -15.336 -10.244 5.658 222.043

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-405.18708	817.88867	-0.495	0.620
Y_hat	44.83838	91.04522	0.492	0.623
I(Y_hat^2)	-1.55358	3.36053	-0.462	0.644
I(Y_hat^3)	0.01750	0.04112	0.426	0.670

Residual standard error: 25.58 on 676 degrees of freedom

Multiple R-squared: 0.003103, Adjusted R-squared: -0.001321

F-statistic: 0.7015 on 3 and 676 DF, p-value: 0.5514

#Blatt 4, Aufgabe 3

```
data = read.table("C:/Users/Bjoern/Desktop/Eigene Dateien/Lehre/2015 SS/Oekonometrie/Blatt
4/schule.txt", header=TRUE, sep=";")
```

```
#data$Lunch = data$Lunch - mean(data$Lunch)
```

```
#data$Schueler = data$Schueler - mean(data$Schueler)
```

#b)

```
model = lm(data$Bestehen~1+data$Lunch+data$Schueler+I(data$Lunch*data$Schueler)+log(data$
Ausgaben) )
```

```
print(summary(model))
```

```
print("_____")
```

#c)

```
print(summary(lm(I(model$residuals^2)~1+data$Lunch+data$Schueler+I(data$Lunch*data$Schueler)+
log(data$Ausgaben))))
```

#d)

```
X = matrix(1,length(data$Lunch), 5)
```

```
X[,2] = data$Lunch
```

```
X[,3] = data$Schueler
```

```
X[,4] = data$Lunch*data$Schueler
```

```
X[,5] = log(data$Ausgaben)
```

```
s2 = sum(model$residuals^2)/(model$df.residual)
```

```
var_normal = s2*solve(t(X)%*%X)
```

```
var_robust = solve(t(X)%*%X)%*%t(X)%*%diag(model$residuals^2)%*%X*solve(t(X)%*%X)
```

#Ausgabe:

Call:

```
lm(formula = data$Bestehen ~ 1 + data$Lunch + data$Schueler +
I(data$Lunch * data$Schueler) + log(data$Ausgaben))
```

Residuals:

Min	1Q	Median	3Q	Max
-57.076	-9.011	0.824	9.171	50.134

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	5.602e+01	1.879e+01	2.981	0.00291 **
data\$Lunch	-3.663e-01	3.748e-02	-9.775	< 2e-16 ***
data\$Schueler	-4.382e-03	4.789e-03	-0.915	0.36034

```
I (data$Lunch * data$Schueler) -1.876e-04 8.437e-05 -2.223 0.02632 *
log (data$Ausgaben) 4.165e+00 2.138e+00 1.948 0.05158 .
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 15.28 on 1687 degrees of freedom

Multiple R-squared: 0.3751, Adjusted R-squared: 0.3736

F-statistic: 253.2 on 4 and 1687 DF, p-value: < 2.2e-16

```
[1] " _____ "
```

Call:

```
lm(formula = I(model$residuals^2) ~ 1 + data$Lunch + data$Schueler +
    I (data$Lunch * data$Schueler) + log (data$Ausgaben))
```

Residuals:

Min	1Q	Median	3Q	Max
-549.81	-176.82	-62.44	57.58	2794.24

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-7.079e+01	4.458e+02	-0.159	0.874
data\$Lunch	5.547e+00	8.893e-01	6.237	5.61e-10 ***
data\$Schueler	4.337e-02	1.136e-01	0.382	0.703
I (data\$Lunch * data\$Schueler)	2.533e-04	2.002e-03	0.127	0.899
log (data\$Ausgaben)	7.730e+00	5.074e+01	0.152	0.879

```
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 362.6 on 1687 degrees of freedom

Multiple R-squared: 0.1461, Adjusted R-squared: 0.144

F-statistic: 72.14 on 4 and 1687 DF, p-value: < 2.2e-16